

REMARKS

This amendment is responsive to the Office Action mailed January 17, 2007. Entry of these amendments and remarks, and reconsideration and allowance of the application as so amended, is earnestly requested.

Status of the Claims

Claims 1-7, 9-14, and 16-18 stand rejected under 35 U.S.C. § 102(e) as being allegedly anticipated by Sodickson, U.S. Publ. Appl. 2002/0158632 (hereinafter "Sodickson").

Claims 8 and 15 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Sodickson in view of Heid, U.S. Patent No. 6,369,569 (hereinafter "Heid").

Claim 13 is objected to for an informality.

The informality in claim 13 is addressed

The cited informality in claim 13 is corrected by the amendment recommended in the Office Action. Accordingly, it is respectfully requested that the objection to claim 13 be withdrawn.

Sodickson does not anticipate any claim of the application

Regarding claim 1, the Office Action alleges that Sodickson teaches, among other items, a method of magnetic resonance imaging comprising the steps of ... moving a subject continuously along a predetermined path

It is respectfully submitted that Sodickson does not disclose, either expressly or inherently, a method of magnetic resonance imaging comprising moving a subject continuously along a predetermined path. Sodickson relates to parallel imaging of a stationary imaging subject, and is not related to the imaging of a continuously moving subject. As described in the present application, a parallel imaging technique such as SENSE (or, quite possibly, the parallel imaging techniques of Sodickson) can be adapted to be used in conjunction with the techniques disclosed and claimed in the present application. That is, they are not mutually exclusive. But, such parallel imaging techniques are conventionally used in conjunction with imaging

a stationary subject. Accordingly, the disclosure in Sodickson of certain parallel imaging techniques does not expressly or inherently disclose the techniques of the present application for imaging a continuously moving subject.

Cited Fig. 20 of Sodickson shows plots which the skilled artisan would readily recognize these as trajectories of magnetic resonance imaging data sampling in k-space. This is confirmed by ¶[0072] which describes Fig. 20 as illustrating “schematically the grouping of acquired k-space lines upon which operations are performed in expanded sub-block hybrid reconstructions.” No movement of the subject, continuous or otherwise, is implied by the plots of Fig. 20. See also ¶[0191] for further description of Fig. 20. Indeed, such k-space sampling trajectories are routinely acquired from stationary imaging subjects.

Cited Fig. 4 of Sodickson shows coil trajectories in the upper left in a fashion more diagrammatic than, but otherwise similar to, Fig. 20. The lower left shows combination of complementary k-space trajectories (Harmonics #0 and #1) to fill in missing lines of each individual trajectory. The right-hand side of Fig. 4 shows reconstructed images corresponding to the data samples acquired via the various k-space trajectories. The “Coil #1”, “Coil #2”, “Coil #3” headings correlate these images with the different spaced-apart coils (20) shown in Fig. 1. No subject motion is involved. Figure caption ¶[0056] states that Fig. 4 “are schematic representations of the SMASH reconstruction procedure.” Again, no movement of the subject, continuous or otherwise, is implied. See also ¶[0022] for more discussion on the SMASH reconstruction procedure illustrated in Fig. 4.

The Office Action cites “Figures 20 and 4(a-c) and diagram on the next page.” Office Action at page 3. It is unclear what “next page” is being referenced. The “next page” respective to Fig. 20 is Fig. 21, which illustrates (¶[0073]) an encoding matrix inversion strategy corresponding to an intermediate basis-hybrid reconstruction. The “next page” respective to Fig. 4 is Fig. 5, which illustrates (¶[0057]) superposition of pixels (white squares) in an aliased image.

Respectfully, none of this remotely suggests, much less expressly or inherently discloses, a method of magnetic resonance imaging comprising moving a subject continuously along a predetermined path. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently

described, in a single prior reference. MPEP § 2131. Applicants respectfully request that the forthcoming Office Action either explain how Sodickson discloses a method of magnetic resonance imaging comprising moving a subject continuously along a predetermined path (as well as the other elements specified in claim 1), or withdraw the anticipation rejection of claim 1 based on Sodickson.

Claim 10 is also rejected as allegedly anticipated by Sodickson, citing ¶¶[0079] and [0004]. These paragraphs describe computational components. However, they do not describe, or disclose expressly or inherently, numerous features of claim 10, including at least continuously moving a sub-volume along a predetermined path together with a subject, the sub-volume being selected such that the time of movement of the sub-volume within the imaging volume is sufficient for magnetic resonance image data acquisition with a preferred resolution; and defining a subsequent sub-volume which neighbours the sub-volume on the predetermined path to perform a subsequent step of magnetic resonance image data acquisition.

Claim 12 is rejected on the same basis as claim 10. Respectfully, nothing in ¶[0004], ¶[0079], or elsewhere in Sodickson discloses a support moving a subject continuously along a predetermined path, as called for in claim 12, or a control unit for generating of control signals for magnetic resonance image data acquisition within a sub-volume of the imaging volume, the sub-volume being moved along the predetermined path together along with the subject. Further, nothing in Sodickson expressly or inherently discloses such a sub-volume being selected such that the time of movement of the sub-volume within the imaging volume is sufficient for magnetic resonance image data acquisition with a predefined resolution and for subsequent magnetic resonance image data acquisition within a subsequent sub-volume which neighbours the sub volume on the predetermined path.

Regarding the rejection of **claims 17 and 18**, the “curved path” identified by the Office Action in its reproduction of Sodickson Fig. 1 (Office Action page 4) is a diagrammatic representation of the head of a human subject. In addition to not being a predetermined path, this feature appears to be well outside of the imaging volume of the diagrammatically illustrated MR system. The “straight line” identified by the Office Action is the subject’s leg, which again is not a predetermined path.

Claims 8 and 15 are rejected as unpatentable over Sodickson and Heid. The comments above pertaining to Sodickson pertain here as well. Heid is applied in the Office Action only to add the concept of a control unit configured with an MRI system to perform cyclic repetitions of the magnetic resonance image acquisition. However, claim 8 calls for more than just cyclic repetition – it calls for the magnetic resonance image data acquisition being cyclically repeated, whereby one repetition is performed for each one of the sub-volumes. This claim is to be read in conjunction with the limitations of base claim 1, including the limitation of moving a subject continuously along a predetermined path, and the defining of the sub-volumes as set forth in base claim 1. In this context, claim 8 measures a plurality of neighboring sub-volumes to acquire data for the entire section (304) of the subject to be imaged, as shown for example in Fig. 3 of the present application.

It is respectfully submitted that claims 8 and 15 patentably distinguish over the combination of Sodickson and Heid, at least because none of Sodickson, Heid, or their combination remotely suggest acquiring magnetic resonance imaging data from a continuously moving subject, much less doing so using the method or apparatus of respective claim 8 or 15.

Added claims 19 and 20 are fully supported by the original specification. The subject matter of claim 19 is supported at least at page 6 lines 10-16. The subject matter of claim 20 is supported at least at page 3 lines 21-22.

For the foregoing reasons, it is respectfully submitted that all claims 1-20 are in condition for allowance. Accordingly, an indication of allowance of claim 1-20 is earnestly requested.

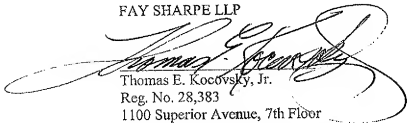
CONCLUSION

For the reasons set forth above, it is submitted that claims 1-20 (all claims) distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event personal contact is deemed advantageous to the disposition of this case, the Examiner is requested and authorized to telephone the undersigned at (216) 861-5582.

Respectfully submitted,

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